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(71) Applicant(s)

NEC Corporation  
(Incorporated in Japan)  
7-1 Shiba 5-chome, Minato-ku, Tokyo 108, Japan

(72) Inventor(s)

Fumiyuki Kobayashi

(74) Agent and/or Address for Service

Mathys & Squire  
100 Grays Inn Road, LONDON, WC1X 8AL,  
United Kingdom

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(54) Abstract Title

Alteration of the orientation of data on a display

(57) The orientation at which data is displayed on portable terminal device is altered by detecting where the device is being held by a user. Pressure sensors or photo cells along two edges of the device may be used to alter the orientation by 90°. The orientation of data on the display may also be altered according to which function is being used or by operating a switch. Alternatively the device may have a plurality of displays at different orientations which may be used according to the way in which the terminal is being used. The portable terminal device may be a selective call receiver or a mobile telephone.

Fig.4a

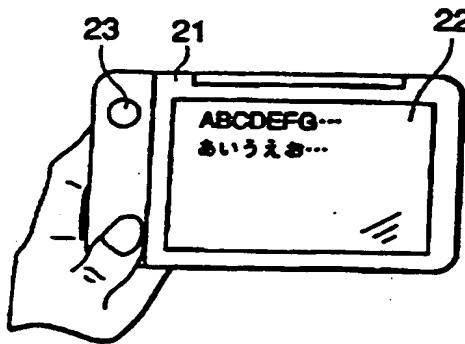
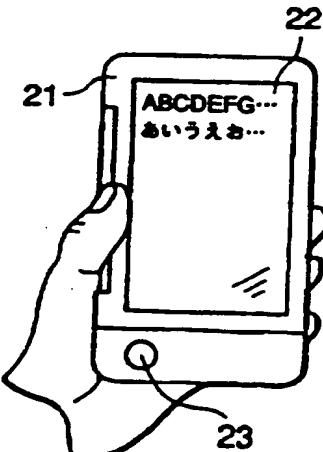


Fig.4b



## PORTABLE TERMINAL DEVICE.

BACKGROUND OF THE INVENTION

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Field of the Invention

The present invention relates to a portable terminal device, and more particularly to a portable terminal device having a display displaying a character string, a symbol or the like.

Description of the Related Art

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Recently, a mobile information terminal having a function such as a communication function using a telephone and a data communication function performed by connecting to a telephone circuit has been widely spread. In this type of mobile information terminal, characters displayed on a display are always displayed parallel to a long side.

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At this time, when a user holds the mobile information terminal parallel to the long side, it is difficult for the user to read the characters displayed on the display. Thus, this terminal has a problem of a serious lack of facilities.

A telephone handset disclosed in Japanese Patent Laid-Open No. Heisei 1(1988)-243646 incorporates a sensor for sensing a direction of gravity. In accordance with a signal from the sensor, the direction of the characters or the like displayed on the display is changed. Even if this telephone handset is tilted, the characters or the like are always displayed in the direction of gravity. Thus, the user easily reads the characters or the like displayed on the display.

However, even if this telephone handset is changed in its direction on a desk, the direction of gravity is not changed and thus

the direction of the characters or the like displayed on the display is not changed.

SUMMARY OF THE INVENTION

5 An object of the present invention is to provide an improved portable terminal device.

In a first aspect, the present invention provides a portable terminal device comprising:

display means for displaying data;

10 means for determining whether said portable terminal device is held by a user; and

control means for automatically controlling a direction in which data is displayed on said display means according to an output of said determining means.

15 In a preferred embodiment, a portable terminal device includes: a display for displaying data; decision circuit for deciding whether or not the portable terminal device is held by a user; and a controller for automatically controlling a direction of screen display on the displaying means in accordance with a result of decision from the decision circuit. The decision circuit is a preferably at 20 least one of a pressure sensor and a photo-detection sensor.

The portable terminal device may further include a 25 setting section for automatically setting a telephone function when the direction of screen display on the display is controlled by the controller. The display may automatically display information about the telephone function when the direction of screen display on the

display is controlled by the controller. The information about the telephone function may be a ten key. The 5 portable terminal device may be either a mobile telephone or a radio selective call receiver.

In a second aspect, the present invention provides a portable terminal device comprising:

10 display means for displaying data;  
means for detecting contact between the device and the user; and

control means for automatically controlling the direction of data display on said display means according to an output of said detecting means.

15 In a preferred embodiment, a portable terminal device includes a display for displaying the data; a decision circuit, for example, a sensor for detecting a contact with the user; and a controller for automatically controlling the direction of screen display in accordance with a result 20 of detection obtained from the decision circuit. The decision circuit may be at least one of a pressure sensor and a photo-detection sensor. The decision circuit may be arranged on a surface other than the surface on which the display is disposed. The decision circuit may be arranged 25 on both side surfaces with respect to the surface on which the display is disposed, in the condition where the portable terminal device is longitudinally held. The controller may set the direction of screen display on the display to a first direction when the user is in contact

with one or both of the decision circuit arranged on both the side surfaces, and the controller sets the direction of screen display on the display to a different second direction from the first direction when the user is in contact with neither of the decision circuit arranged on both the side surfaces. The portable terminal device may further include at least one recess arranged on the surface even with the surface on which the display is disposed, wherein the decision circuit is disposed in the recess. The recess may be shaped so that it may fit the finger of the user. The portable terminal device may further include setting section for automatically setting the telephone function when the direction of screen display on the display is controlled by the controller. The display may automatically display the information about the telephone function when the direction of screen display on the display is controlled by the controller. The information about the telephone function may be a ten key. The portable terminal device may be either a mobile telephone or a radio selective call receiver.

In a third aspect, the present invention provides a portable terminal device comprising:

25           display means for displaying data;  
          means for determining which function of a plurality of functions is being used by the device; and  
          switching means for automatically switching the direction of data display on said display means in

accordance with an output from said determining means.

5        In a preferred embodiment, a portable terminal device includes a display for displaying the data; a decision circuit or section for deciding which function of a plurality of functions is used; and a controller for automatically controlling the direction of screen display  
10      on the displaying means in accordance with a result of decision obtained from the decision circuit. The controller may automatically control the direction of screen display on the display when the decision circuit decides that the telephone function of the plurality of  
15      functions is used.

The portable terminal device may be either a mobile telephone or a radio selective call receiver.

In a fourth aspect, the present invention provides a portable terminal device comprising:

20      display means for displaying data;  
          means for switching the direction of data display on said display means; and  
          control means for controlling the direction of data display on said display means in response to an operation  
25      of said switching means.

The display means may be arranged on a surface even with the switching means.

In a fifth aspect, the present invention provides a portable terminal device comprising:

5                   a plurality of display screens; and  
means for automatically selecting and displaying data  
on one of said plurality of display screens in accordance  
with the way the portable terminal device is being used.

10                  In a preferred embodiment, a portable terminal device  
includes a plurality of display screens; and display for  
automatically selecting and displaying one of the plurality  
of display means in accordance with an application. The  
application may be determined in accordance with the  
direction of the portable terminal device. The application  
may be determined in accordance with whether or not the  
user touches a predetermined portion.

15                  In a sixth aspect, the present invention provides a  
method of controlling a direction of data display on a  
display of a portable terminal device, comprising the steps  
of:

20                  determining whether said portable terminal device is  
held by a user; and

                        automatically controlling the direction of data  
display on said display in accordance with a result of the  
determination.

25                  In a preferred embodiment, a method of controlling a  
direction of data display of a portable terminal device  
includes the steps of; displaying data on a display;  
deciding whether or not the portable terminal device is  
held by a user; and automatically controlling the direction  
of screen display on the display in accordance with a

result of decision obtained from the deciding step. The controlling step may further include the steps of: deciding whether or not the direction of screen display on the display is previously set to a first direction, when the deciding step decides that the portable terminal device is held by the user; displaying the data without controlling the direction of screen display on the display, when the direction of screen display is previously set to the first direction; and displaying the data by controlling the direction of screen display on the display to the first direction, when the direction of screen display is not previously set to the first direction.

In a seventh aspect, the present invention provides a method of controlling a direction of data display on a display of a portable terminal device, comprising the steps of:

determining whether a telephone function is used; and automatically controlling the direction of data display on said display in accordance with a result of said determining step.

In a preferred embodiment, a method of controlling a direction of screen display of a portable terminal device includes the steps of: displaying data on a display; deciding whether or not a telephone function is used; and automatically controlling the direction of screen display on the display in accordance with a result of decision obtained from the deciding step.

5        In an eight aspect, the present invention provides a method of controlling a direction of data display on a display of a portable terminal device, comprising the steps of:

10      determining whether an instruction to control the direction of data display on said display is given; and automatically controlling the direction of data display on said display in accordance with a result of said determining step.

15      In a preferred embodiment, a method of controlling a direction of screen display of a portable terminal device includes the steps of: displaying data on a display; deciding whether or not an instruction to control the direction of screen display on the display is given; and automatically controlling the direction of screen display on the display in

accordance with a result of decision obtained from the deciding step.

The controlling step may further

include the steps of: deciding whether or not the direction of screen display on the display is previously set to a first direction, when the deciding step decides that the instruction to control the direction of screen display is given; displaying the data without controlling the direction of screen display on the display, when the direction of screen display is previously set to the first direction; and displaying the data by controlling the direction of screen display on the display to the first direction, when the direction of screen display is not previously set to the first direction. The method of controlling a direction of screen display of a portable terminal device may further include the steps of: automatically setting the telephone function when the direction of screen display on the display is controlled. The method of controlling a direction of screen display of a portable terminal device may further include the steps of: automatically displaying the information about the telephone function when the direction of screen display on the display is controlled.

Accordingly,

the direction of display

screen on the display can be controlled only by the user's operation of the controling button disposed on the portable terminal device. A general-purpose properties can be thus improved.

Moreover, the direction of screen display on the display can be controlled in accordance with whether or not the user's fingers and palm come into contact with a pressure sensor or a photo-detection sensor on any surface of a portable terminal device body. Thus, the direction of

display screen on the display can be automatically controled in response to how the user holds the portable terminal device, without needing any user's operation. An operability can be thus enhanced.

Furthermore, the pressure sensor or the photo-detection sensor 5 can be arranged on the surface other than the surface having the display, whereby there is no need for an additional space for the controlling button for controlling the direction of screen display on the display. A miniaturization can be thus realized.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Preferred features of the present invention will now be described, purely by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is an external plan view of a general mobile information 15 terminal 1;

Fig. 2 shows a circuit constitution of the mobile information terminal 1 shown in Fig. 1;

Fig. 3 shows the circuit constitution of the mobile information terminal 1 shown in Fig. 2 having an additional telephone function;

20 Figs. 4a and 4b are external plan views of a preferred embodiment in which a screen display on a display of the mobile information terminal is set along a long side and along a short side;

Fig. 5 shows the circuit constitution of a preferred embodiment 25 of the mobile information terminal shown in Figs. 4a and 4b;

Fig. 6 is a flow chart for describing a controlling operation of a preferred embodiment of a direction of display on the display in

response to a user's operation in the mobile information terminal shown in Figs. 4a and 4b;

Fig. 7 is a flow chart for describing the controlling operation of a preferred embodiment of the direction of display on a display 22 5 in response to the function for use in a mobile information terminal 21 shown in Figs. 4a and 4b;

Figs. 8a and 8b are an external plan view and a perspective view 10 of a preferred embodiment in which the screen display on the display of a second embodiment of a mobile information terminal is set along the long side;

Figs. 9a and 9b are an external plan view and a perspective view of a preferred embodiment in which the screen display on the display of the mobile information terminal shown in Figs. 8a and 8b is set along the short side;

Fig. 10 illustrates an example of the display of a preferred embodiment of the display in which a schedule function of the mobile information terminal shown in Figs. 8a and 8b is used;

Fig. 11 shows the circuit constitution of a preferred embodiment 20 of the mobile information terminal shown in Figs. 8a and 8b and Figs. 9a and 9b;

Fig. 12 is an external plan view of a preferred embodiment in which the screen display on the display of a third embodiment of a mobile information terminal is set along the long side;

Fig. 13 shows the circuit constitution of a preferred embodiment 25 of the mobile information terminal shown in Fig. 12; and

Fig. 14 illustrates an arrangement of a preferred embodiment of

a pressure sensor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 First, to facilitate understanding of the present invention, a general mobile information terminal will be described with reference to Fig. 1, 2 and 3.

Fig. 1 is an external plan view of the general mobile information terminal.

10 In Fig. 1, a mobile information terminal 1 has a rectangular display 2 which is constituted by a LCD. This mobile information terminal 1 is designed so that contents displayed on the display 2 is displayed in a direction parallel to a long side. Thus, the contents displayed on the display 2 are always displayed parallel to a longitudinal direction and are not displayed parallel to a short side.

15 Using Fig. 2, a circuit constitution of the mobile information terminal 1 shown in Fig. 1 will be described.

20 In Fig. 2, when data is inputted from an input section 3 such as a touch panel or a button, the input data is processed in a controller 4. The input data is also stored in a storage 5 and displayed on the display 2. The input section 3 is operated, whereby the data stored in the storage 5 is read out and displayed on the display 2.

Among this type of mobile information terminals, some terminals have a telephone function. That is, they incorporate PHS in the body thereof and are used as PHS telephone.

25 Using Fig. 3, the circuit constitution of the mobile information terminal 1 shown in Fig. 2 having an additional telephone function will be described. The same elements as the elements shown in Fig. 2 have the same reference numerals.

In Fig. 3, when the telephone function is used, a telephone number to be called is inputted from the input section 3. The telephone number to be called inputted from the input section 3 is transmitted/received from an antenna 11 through a controller 6 and a 5 radio section 10. When a voice is transmitted/received, an audio amplifier 9, a receiver 7 and a microphone 8 which serve as an input/output unit are used. When the data other than the voice is transmitted/received, the input section 3 and the display 2 are used.

However, this type of portable terminal device 1 has a problem 10 of a serious lack of facilities, because the contents displayed on the display 2 are always displayed parallel to the longitudinal direction and are not displayed parallel to the short side. Now will be described in detail the present invention with reference to Figs. 4 to 14.

15 In view of the above-mentioned problems, in a preferred embodiment the present invention enhances an operability by controlling the direction of screen display on the display in accordance with whether or not the user's fingers and palm came into contact with a pressure sensor or a photo-detection sensor on any surface of a portable terminal device body.

20 Figs. 4a and 4b are external plan views of a preferred embodiment in which the screen display on the display of the portable terminal device or preferably the mobile information terminal

is set parallel to the long side of the display and parallel to the short side thereof.

25 In Fig. 4a, the screen display such as characters and symbols is displayed parallel to the long side of the rectangular display on a display 22 such as LCD of a mobile information terminal 21. In this

situation, when the user operates a controlling button 23, the direction of screen display on the display 22 is controlled to the direction parallel to the short side as shown in Fig. 4b. Similarly, in the state where the screen display is displayed along the short side 5 on the display 22 in Fig. 4b, when the user operates the controlling button 23, the direction of screen display on the display 22 is controlled to the direction parallel to the long side as shown in Fig. 4a. The direction of a screen display can be switched alternatively.

Although the rectangular display is described in Figs. 4a and 4b, 10 the present invention is not limited to the rectangular display. A square display may be also used. That is, the screen display may be displayable in a transverse direction along each of two perpendicular sides. In other words, the screen display may be displayed in a constant direction for the user, for example, in the transverse 15 direction, regardless of the direction of the mobile information terminal. The same is true of all the following embodiments.

Using Fig. 5, the circuit constitution of a preferred embodiment of the mobile information terminal 21 shown in Figs. 4a and 4b will be described.

20 In Fig. 5, the data inputted from an input section 24 is processed in a controller 25 and then stored in a storage 26. The input section 24 is operated, whereby the data stored in the storage 26 is read out and displayed on the display 22. The direction of display 25 on the display 22 is selectively set to the display along the short side or the display along the long side by the user's operation of the controlling button 23. It is preferable that the input section 24 is the touch panel or the button.

Next, Fig. 6 is used so as to describe in detail the controlling operation of a preferred embodiment of a direction of display on the display 22 in response to the user's operation in the mobile information terminal 21 shown in Figs. 4a and 4b.

5 In Fig. 6, a determination is made as to whether or not the user gave an instruction to control the direction of screen display, i.e., whether or not the controlling button 23 was operated (step 101). If it is determined that the user gave the instruction to control the direction of screen display (YES in step 101), it is determined whether 10 or not the direction of display on the display 22 is currently set to the direction of the long side (step 102). If the direction of display on the display 22 is set to the direction of the long side (YES in step 102), the direction of display on the display 22 is controlled and then the characters or the like are displayed along the short side (step 103). On the other hand, if the direction of display on the display 22 15 is set to the direction of the short side (NO in step 102), the direction of display on the display 22 is controlled and then the characters or the like are displayed along the long side (step 104).

If it is determined that the user gave no instruction to control 20 the direction of screen display (NO in step 101), the characters or the like are displayed in the direction of screen display which is currently set (step 105).

In this manner, the user operates the controlling button 23 in accordance with the situation or the application, whereby the display 25 screen on the display 22 is controlled between the direction of the short side and the direction of the long side.

In the state where the display 22 is set to the direction of the

short side, the display 22 can display not only the information displayed during setting the direction of the long side but also the information required for the use of the telephone function, for example, a ten key or the like for inputting the telephone number. In this case, 5 the information needed for the use of the telephone function should preferably be automatically displayed when the direction of screen display on the display 22 is set to the direction of the short side by operating the controlling button 23. Alternatively, a different button (not shown) from the controlling button 23 may be operated by the user, 10 whereby the information is displayed. On the other hand, as a matter of course, the same is true of the contents displayed when the display 22 is set to the direction of the long side during using the telephone function.

Fig. 7 is used so as to describe in detail the controlling 15 operation of a preferred embodiment of the direction of display on the display 22 in the case of using the telephone function.

In Fig. 7, the determination is made as to whether or not the operation for using the telephone function, for example, the push of the button (not shown) was performed by the user (step 201). If the 20 operation for using the telephone function was performed (YES in step 201), the direction of screen display on the display 22 is automatically set to the direction of the short side (step 202). On the other hand, if the operation for using the telephone function was not performed (NO in step 201), the direction of screen display on the 25 display 22 is automatically set to the direction of the long side (step 203).

Figs. 8a and 8b are an external plan view and a perspective view

of a preferred embodiment in which the screen display on the display of the portable terminal device or preferably the mobile information terminal of a second embodiment is set

parallel to the long side of the display. Figs. 9a and 9b are an

5 external plan view and a perspective view of a preferred embodiment in which the screen display on the display of the portable terminal device or preferably the mobile information terminal of the second embodiment is set parallel to the short side of the display.

10 In Figs. 8a and 9a, a mobile information terminal 31 has the functions of a telephone directory, an address book, a schedule, a memo, etc. which are used in the form of an electronic tool containing the necessary information which the user has put down in a datebook or the like. The mobile information terminal 31 also has PIM (personal 15 information management) function including the telephone function and an electronic mail function.

When the function of the schedule, the memo, etc. is used, the direction of screen display on a display 32 is typically along the long side. Thus, as shown in Fig. 8a, the mobile information terminal 31 is 20 laterally used and held. It is preferable that the display 32 includes LCD. Fig. 10 shows an example of the display of a preferred embodiment of the display 32 in which the schedule function is used.

On the other hand, when the telephone function is used, the direction of screen display on the display 32 is typically along the 25 short side. Thus, as shown in Fig. 9a, the mobile information terminal 31 is longitudinally used and held.

In Figs. 8b and 9b, when the mobile information terminal 31 is

laterally used and held, pressure sensors 33 and 34 are disposed on the upper and lower surfaces of the mobile information terminal 31. When the mobile information terminal 31 is longitudinally used and held, the pressure sensors 33 and 34 are disposed on both the side surfaces of 5 the mobile information terminal 31. The user's fingers and palm come into contact with the pressure sensor 33 and/or the pressure sensor 34, whereby the direction of screen display on the display 32 is controlled. That is, when the user uses and holds the mobile information terminal 31 laterally as shown in Figs. 8a and 8b, the user's fingers and palm 10 do not come into contact with the pressure sensors 33 and 34. Thus, the screen is displayed along the long side on the display 32. On the other hand, when the user uses and holds the mobile information terminal 31 longitudinally as shown in Figs. 9a and 9b, the user's fingers and palm come into contact with the pressure sensors 33 and/or 15 34. Thus, the screen is displayed along the short side on the display 32.

In this way, the direction of display can be automatically changed in accordance with the direction in which the user views the display.

20 Using Fig. 11, the circuit constitution of a preferred embodiment of the mobile information terminal 31 shown in Figs. 8a and 8b and Figs. 9a and 9b will be described.

In Fig. 11, when the data is inputted from an input section 35, the input data is processed in a controller 36. The data is stored in 25 a storage 37 and displayed on the display 32. The input section 35 is operated, whereby the data stored in the storage 37 is read out and displayed on the display 32. It is preferable that the input section

35 is the touch panel or the button.

The direction of screen display on the display 32 is controlled by the controller 36 in accordance with whether or not the signal from the pressure sensors 33 and 34 is detected. That is, when the user's 5 fingers and palm do not come into contact with the pressure sensors 33 and 34, the signal is not outputted from the pressure sensors 33 and 34. Thus, the controller 36 controls the display 32 so that the direction of screen display is set to the direction of the long side. On the other hand, when the user's fingers and palm come into contact with the 10 pressure sensors 33 and 34, the signal is outputted from the pressure sensors 33 and 34. When the signal is inputted from the pressure sensors 33 and/or 34, the controller 36 controls the display 32 so that the direction of screen display is set to the direction of the short side. The direction of screen display can be controlled in accordance 15 with, for example, whether a binary signal has one value or the other value, instead of whether or not the signal is detected.

When the telephone function is used, the telephone number to be called is inputted from the input section 35. The telephone number to be called inputted from the input section 35 is transmitted/received 20 from an antenna 42 through the controller 36 and a radio section 41. When the voice is transmitted/received, an audio amplifier 40, a receiver 38 and a microphone 39 are used as the input/output unit. When the data other than the voice is transmitted/received, the input section 35 and the display 32 are used.

25 In this manner, the display screen on the display 32 can be automatically controlled between the direction of the short side and the direction of the long side in response to how the user holds the

mobile information terminal 31, without necessity of any operation. Since it is unnecessary to provide the controlling button 23 shown in Fig. 4, a miniaturization can be realized without addition of a new space for the provision of the controlling button.

5 The operation for controlling the display 32 in response to the operation performed by the user of the mobile information terminal 31 is the same as the operation in a flow chart shown in Fig. 6. For avoiding the repeated description, the description is omitted. It should be noted that step 101 shown in Fig. 6, i.e., "whether or not 10 the instruction to control the direction of screen display is given" corresponds to "whether or not the user's fingers and palm come into contact with the pressure sensors 33 and/or 34" in this embodiment.

15 In the state where the display 32 is set to the direction of the short side, the display 32 can display not only the information displayed during setting the direction of the long side but also the information required for the use of the telephone function, for example, the ten key or the like for inputting the telephone number. The information needed for the use of the telephone function should be 20 preferably displayed automatically when the direction of screen display on the display 32 is set to the direction of the short side. Alternatively, the button (not shown) may be operated by the user, whereby the information is displayed. Of course, the same is true of the contents displayed when the display 32 is set to the direction of the long side during the use of the telephone function.

25 The operation for controlling the display 32 in response to the function used in this mobile information terminal 31 is the same as the operation in the flow chart shown in Fig. 7. For avoiding the repeated

description, the description is omitted.

Fig. 12 is an external plan view of a preferred embodiment in which the screen display on the display of the portable terminal device or preferably the mobile information terminal of a third embodiment  
5 is set parallel to the long side of the display.

In Fig. 12, a mobile information terminal 51 includes a recess 53 on the same plane where a display 52 is provided. A photo-detection sensor 54 is arranged in the recess 53. It is preferable that this recess 53 is recessed so that it may fit the user's finger, more  
10 particularly, the thumb.

When the user laterally uses and holds the mobile information terminal 51, the user's finger is put on the recess 53 in which the photo-detection sensor 54 is arranged. Since an external light is shut out in the photo-detection sensor 54, the screen is displayed along the  
15 long side on the display 52. On the other hand, when the user longitudinally uses and holds the mobile information terminal 51, the user's finger is not put on the recess 53 in which the photo-detection sensor 54 is arranged. Since the external light is sensed by the photo-detection sensor 54, the screen is displayed along the short side  
20 on the display 52.

In this manner, the direction of screen display on the display 52 is controlled in accordance with whether or not the external light is sensed by the photo-detection sensor 54.

The operation for controlling the display 52 in response to the  
25 operation performed by the user of the mobile information terminal 51 is the same as the operation in the flow chart shown in Fig. 6. For avoiding the repeated description, the description is omitted. It

should be noted that step 101 shown in Fig. 6, i.e., "whether or not the instruction to control the direction of screen display is given" corresponds to "whether or not the external light is sensed by the photo-detection sensor 54" in this embodiment.

5 - Using Fig. 13, the circuit constitution of a preferred embodiment of the mobile information terminal 51 shown in Fig. 12 will be described.

In Fig. 13, when the data is inputted from an input section 55, the input data is processed in a controller 56. The input data is then 10 stored in a storage 57 and displayed on the display 52. The input section 55 is operated, whereby the data stored in the storage 57 is read out and displayed on the display 52. It is preferable that the input section 55 is the touch panel or the button.

The direction of screen display on the display 52 is controlled 15 by the controller 56 in accordance with whether or not the signal from the photo-detection sensor 54 is detected. That is, when the user's fingers and palm are not put on the photo-detection sensor 54, the signal is not outputted from the photo-detection sensor 54. Thus, the controller 56 controls the display 52 so that the direction of screen 20 display is set to the direction of the long side. On the other hand, when the user's fingers and palm are put on the photo-detection sensor 54, the signal is outputted from the photo-detection sensor 54. When the signal is inputted from the photo-detection sensor 54, the controller 56 controls the display 52 so that the direction of screen 25 display is set to the direction of the short side.

When the telephone function is used, the telephone number to be called is inputted from the input section 55. The telephone number to

be called inputted from the input section 55 is transmitted/received from an antenna 62 through the controller 56 and a radio section 61. When the voice is transmitted/received, an audio amplifier 60, a receiver 58 and a microphone 59 are used as the input/output unit.

5 When the data other than the voice is transmitted/received, the input section 55 and the display 52 are used.

In this manner, the display screen on the display 52 can be automatically controlled between the direction of the short side and the direction of the long side in response to how the user holds the

10 mobile information terminal 51, without necessity of any operation.

In the state where the display 52 is set to the direction of the short side, the display 52 can display not only the information displayed during setting the direction of the long side but also the information required for the use of the telephone function, for example,

15 the ten key or the like for inputting the telephone number. The information needed for the use of the telephone function is automatically displayed, when the direction of screen display on the display 52 is set to the direction of the short side. However, the button (not shown) may be operated by the user, whereby the information

20 is displayed. Of course, the same is true of the contents displayed when the display 52 is set to the direction of the long side during the use of the telephone function.

The operation for controlling the display 52 in response to the function used in this type of mobile information terminal 51 is the

25 same as the operation in the flow chart shown in Fig. 7. For avoiding the repeated description, the description is omitted.

Although the present invention is described above with reference

to the preferred embodiments, the portable terminal device of the present invention is not limited to the above embodiments. For example, although the portable terminal device of this embodiment includes the two pressure sensors 33 and 34, the number of pressure sensors is not limited at all. Fig. 14 shows an example in which one pressure sensor 74 is arranged. The photo-detection sensor 54 shown in Fig. 12 is replaced by the pressure sensor 74. That is, a mobile information terminal 71 comprises a recess 73 on the same plane where a display 72 is provided. The pressure sensor 74 is arranged in the recess 73. In this manner, the direction of screen display on the display 72 is automatically controlled in accordance with whether or not the user's finger comes into contact with the pressure sensor 74.

Moreover, a place where the pressure sensor is arranged is not limited at all. For example, in the portable terminal device of this embodiment, the pressure sensors 33 and 34 are arranged on the upper and lower surfaces or on the side surfaces with respect to the surface on which the display is arranged. However, even if the pressure sensor is arranged on the back surface opposite to the front surface on which the display is arranged, there is no problem. On the other hand, as shown in Fig. 14, the pressure sensor 74 may be arranged on the same plane where the display 72 is arranged.

Moreover, the photo-detection sensor is the same as the pressure sensor in that the number thereof and its place are not limited.

In the portable terminal device of this embodiment, when the user's fingers and palm come into contact with the pressure sensors 33 and/or 34, the direction of screen display on the display 32 is automatically controlled to the longitudinal direction. However, the

display 32 may be controlled in such a manner that the direction of screen display on the display 32 is not automatically controlled to the longitudinal direction until the user's fingers and palm come into contact with both the pressure sensors 33 and 34.

5        In the portable terminal device of this embodiment, when the function of the schedule, the memo, etc. is used, the direction of screen display on the display 32 is previously set to the direction of the long side. On the other hand, when the telephone function is used, the direction of screen display on the display 32 is previously set to 10 the direction of the short side. However, the control or the like (not shown) is operated by the user, whereby the direction of screen display can be previously set in response to the function.

15      In the portable terminal device of this embodiment, the mobile information terminal is described as an example. However, of course, the present invention can be also applied to a mobile telephone, a radio selective call receiver or the like.

20      Although the display is quadrilateral in the above-described embodiments, it may be elliptical. That is, obviously, as long as the direction of display is changed in two perpendicular directions within the display in response to the direction of the device, any shape is possible for the control of bidirectional electrodes on LCD.

As described above,

25      the direction of display screen on the display can be controlled only by the user's operation of the controlling button disposed on the portable terminal device. The general-purpose properties can be thus improved.

Moreover, the direction of screen display on the display can be

controlled in accordance with whether or not the user's fingers and palm come into contact with the pressure sensor or the photo-detection sensor on any surface of the portable terminal device body. Thus, the direction of display screen on the display can automatically controlled 5 in response to how the user holds the portable terminal device, without needing any user's operation. The operability can be thus enhanced.

Furthermore, the pressure sensor or the photo-detection sensor is arranged on the surface other than the surface having the display, whereby there is no need for an additional space for the controlling 10 button for controlling the direction of screen display on the display. The miniaturization can be thus realized.

Obviously, numerous additional modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended 15 claims, the invention may be practiced otherwise than as specifically described herein.

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

Statements in this specification of the "objects of the invention" relate to preferred embodiments of the invention, but not necessarily to all embodiments of the invention falling within the claims.

The description of the invention with reference to the drawings is by way of example only.

The text of the abstract filed herewith is repeated here as part of the specification.

Pressure sensors 33 and 34 are disposed on the upper and lower surfaces of the laterally held mobile information terminal 31 or on both the side surfaces of the longitudinally held mobile information terminal 31. The user's fingers and palm contact the pressure sensors 33 and 34, whereby a direction of screen display on a display 32 is controlled. Namely, when the user laterally holds the mobile information terminal 31, the user's fingers and palm do not contact the pressure sensors 33 and 34. Thus, a screen is displayed along a long side on the display 32. When the user longitudinally holds the mobile information terminal 31, the user's fingers and palm contact the pressure sensors 33 and 34. Thus, the screen is displayed along a short side on the display 32.

CLAIMS

1. A portable terminal device comprising:  
display means for displaying data;  
means for determining whether said portable terminal  
device is held by a user; and  
control means for automatically controlling a  
direction in which data is displayed on said display means  
according to an output of said determining means.
  
- 10 2. A portable terminal device as claimed in Claim 1,  
wherein said determining means is at least one of a  
pressure sensor and a photo-detection sensor.
  
- 15 3. A portable terminal device as claimed in Claim 1 or 2,  
further comprising:  
means for automatically setting a telephone function  
when the direction of data display on said display means is  
controlled by said control means.
  
- 20 4. A portable terminal device as claimed in Claim 3,  
wherein said display means is adapted to automatically  
display information about the telephone function when the  
direction of data display on said display means is  
controlled by said control means.
  
- 25 5. A portable terminal device as claimed in Claim 4,  
wherein said information about the telephone function is a  
ten key.

6. A portable terminal device as claimed in any preceding claim, wherein said portable terminal device is a mobile telephone.

5

7. A portable terminal device as claimed in any of Claims 1 to 5, wherein said portable terminal device is a radio selective call receiver.

10

8. A portable terminal device comprising:  
display means for displaying data;  
means for detecting contact between the device and the user; and

15

control means for automatically controlling the direction of data display on said display means according to an output of said detecting means.

20

9. A portable terminal device as claimed in Claim 8, wherein said detecting means is at least one of a pressure sensor and a photo-detection sensor.

25

10. A portable terminal device as claimed in Claim 8 or 9, wherein said detecting means is arranged on a surface other than the surface on which said display means is disposed.

11. A portable terminal device as claimed in Claim 8 or 9, wherein said detecting means is arranged on surface to the side of the surface on which said display means is disposed, in the condition where said portable terminal

device is longitudinally held.

5       12. A portable terminal device as claimed in Claim 11,  
wherein said control means is adapted to set the direction  
of data display on said display means to a first direction  
when the user is in contact with detecting means arranged  
10      on one of said surfaces, and said control means is adapted  
to set the direction of data display on said display means  
to a second direction different from said first direction  
when the user is not in contact with said detecting means.

15      13. A portable terminal device as claimed in Claim 8,  
further comprising:  
              at least one recess arranged on the surface on which  
              said display means is disposed,  
              said detecting means being disposed in said recess.

20      14. A portable terminal device as claimed in Claim 13,  
wherein said recess is shaped so that it conforms to the  
shape of the finger of said user.

25      15. A portable terminal device as claimed in Claim 8,  
further comprising:  
              setting means for automatically setting the telephone  
              function when the direction of data display on said display  
              means is controlled by said control means.

16. A portable terminal device as claimed in Claim 8,  
wherein said display means is adapted to automatically  
5 display the information about the telephone function when  
the direction of screen display on said display means is  
controlled by said control means.

17. A portable terminal device as claimed in Claim 16,  
10 wherein said information about the telephone function is a  
ten key.

18. A portable terminal device as claimed in Claim 17,  
wherein said portable terminal device is a mobile  
15 telephone.

19. A portable terminal device as claimed in Claim 17,  
wherein said portable terminal device is a radio selective  
call receiver.

20

20. A portable terminal device comprising:  
display means for displaying data;  
means for determining which function of a plurality of  
functions is being used by the device; and  
25 switching means for automatically switching the  
direction of data display on said display means in  
accordance with an output from said determining means.

21. A portable terminal device as claimed in Claim 20,  
wherein said switching means automatically switches the  
direction of data display on said display means when said  
determining means determines that a telephone function of  
said plurality of function is being used.

5

22. A portable terminal device as claimed in Claim 20 or  
21, wherein said portable terminal device is a mobile  
10 telephone.

15

23. A portable terminal device as claimed in Claim 20 or  
21, wherein said portable terminal device is a radio  
selective call receiver.

24. A portable terminal device comprising:  
display means for displaying data;  
means for switching the direction of data display on  
said display means; and  
control means for controlling the direction of data  
display on said display means in response to an operation  
of said switching means.

20

25. A portable terminal device as claimed in Claim 24,  
wherein said display means is arranged on a surface even  
25 with said switching means.

26. A portable terminal device comprising:  
a plurality of display screens; and

means for automatically selecting and displaying data on one of said plurality of display screens in accordance with the way the portable terminal device is being used.

5

27. A portable terminal device as claimed in Claim 26, wherein the way the device is being used is determined in accordance with the orientation of said portable terminal device.

10

28. A portable terminal device as claimed in Claim 26, wherein the way the device is being used is determined in accordance with whether the user touches a predetermined portion of the device.

15

29. A method of controlling a direction of data display on a display of a portable terminal device, comprising the steps of:

20

determining whether said portable terminal device is held by a user; and

automatically controlling the direction of data display on said display in accordance with the result of the determination.

25

30. A method as claimed in Claim 29, wherein said controlling step further comprises the steps of:

deciding whether the direction of data display on said display is previously set to a first direction, when it is determined that said portable terminal device is

held by the user;

5 displaying said data without switching the direction of data display on said display, when the direction of screen display is previously set to said first direction; and

10 displaying said data by switching the direction of data display on said display to said first direction, when the direction of data display is not previously set to said first direction.

31. A method of controlling a direction of data display on a display of a portable terminal device, comprising the steps of:

15 determining whether a telephone function is used; and automatically controlling the direction of data display on said display in accordance with a result of said determining step.

20 32. A method of controlling a direction of data display on a display of a portable terminal device, comprising the steps of:

25 determining whether an instruction to control the direction of data display on said display is given; and automatically controlling the direction of data display on said display in accordance with a result of said determining step.

33. A method as claimed in Claim 32, wherein said controlling step further comprises the steps of:

5 deciding whether the direction of data display on said display is previously set to a first direction, when it is determined that the instruction to control the direction of data display is given;

10 displaying said data without switching the direction of data display on said display, when the direction of data is previously set to said first direction; and

15 displaying said data by controlling the direction of data display on said display to said first direction, when the direction of data display is not previously set to said first direction.

15

34. A method as claimed in Claim 32 or 33, further comprising the steps of:

20 automatically setting a telephone function when the direction of data display on said display is controlled.

20

35. A method as claimed in Claim 32 or 33, further comprising the steps of:

25 automatically displaying information about a telephone function when the direction of data display on said display is controlled.

36. A portable terminal device substantially as herein described with reference to and as shown in any of Figures 4a, 4b, 5, 8a, 8b, 9a, 9b, 11, 12, 13 or 14 of the

accompanying drawings.

5 37. A method of controlling a direction of data display on a display of a portable terminal device substantially as herein described with reference to Figure 6 or 7 of the accompanying drawings.



Application No: GB 9824281.1  
Claims searched: 1-7, 8-19, 29-30, 36-37

Examiner: Glyn Hughes  
Date of search: 26 February 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed. Q): G4A (AKS), G4H (HRCU), H4L (LECX), H4T (TBAX)

Int Cl (Ed.6): G06F 3/147, G08B 3/10, H04B 1/38, H04M 1/00, 1/02, 1/72, H04C 7/14, 7/16, 7/18, 7/32

Other: Online: WPI, PAJ, EPODOC

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2297661 A (MOTOROLA) see page 8 line 23 to page 9 line 20	-
A	GB 2191323 A (NEC) see abstract	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Fig.1 Prior Art

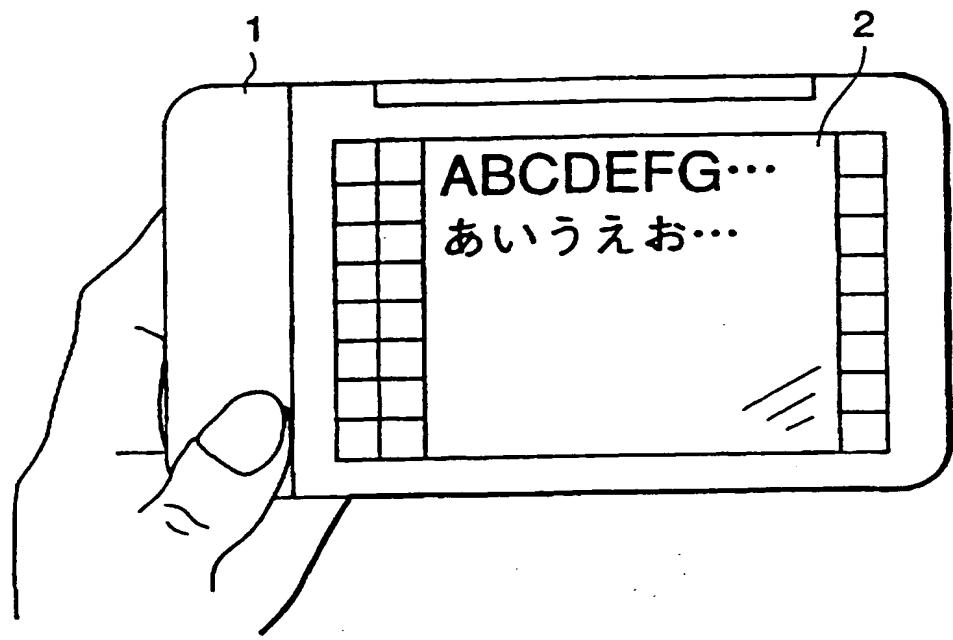


Fig.2 Prior Art

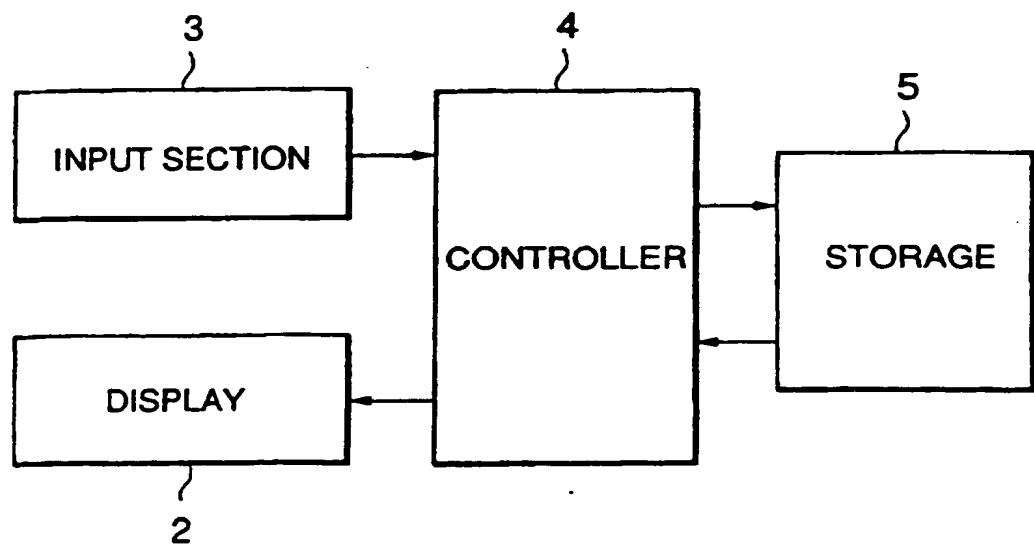
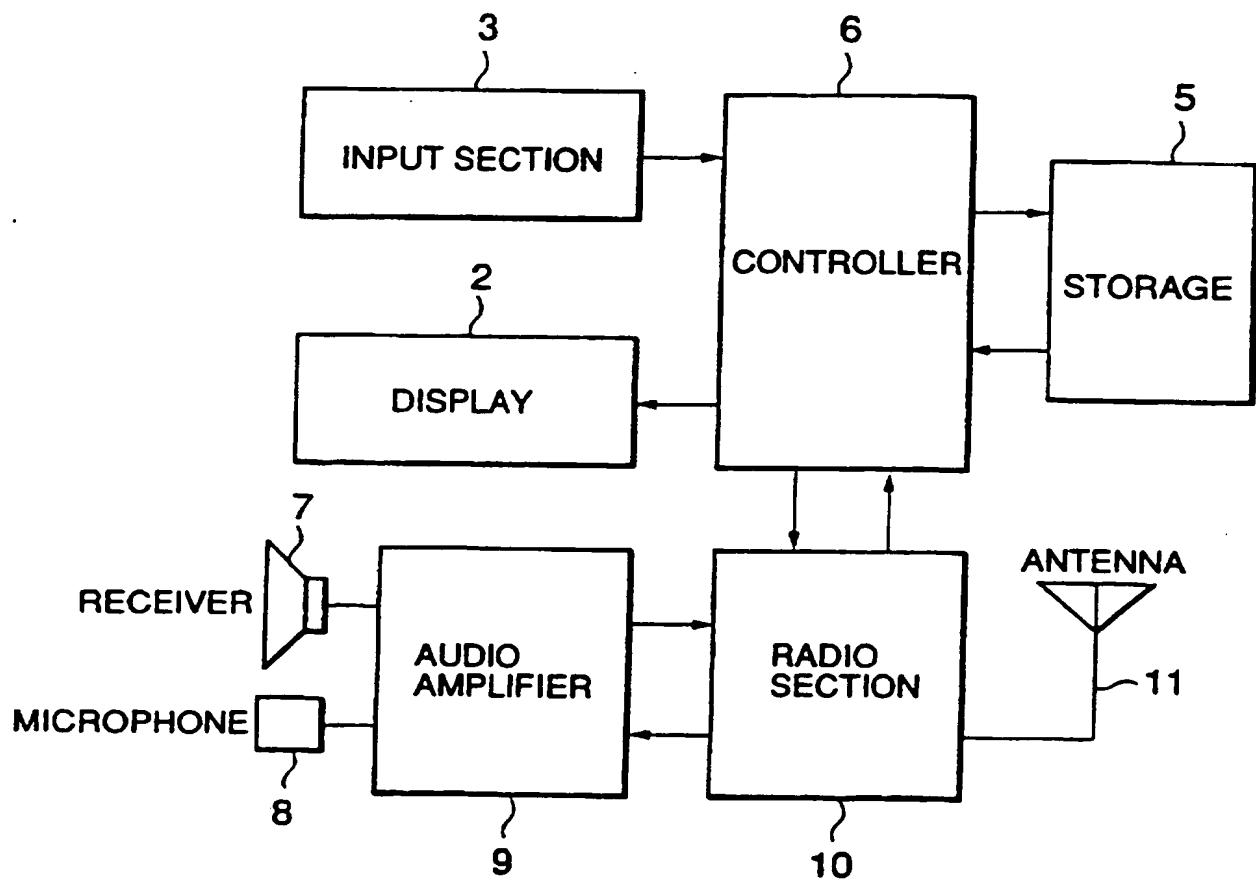


Fig.3 Prior Art



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Fig.4a

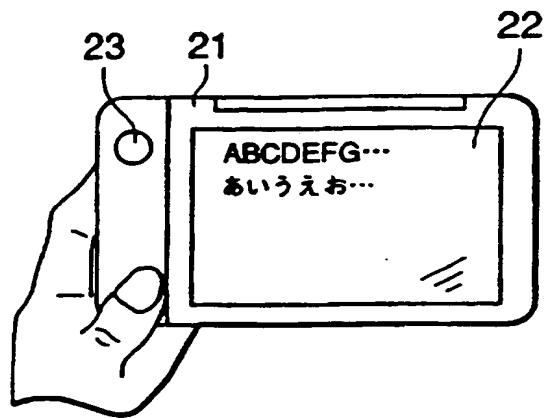
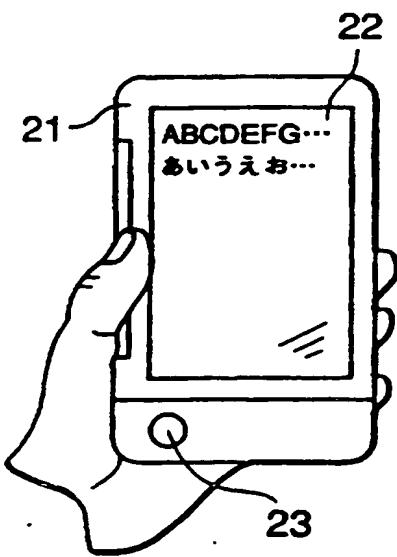


Fig.4b



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Fig.5

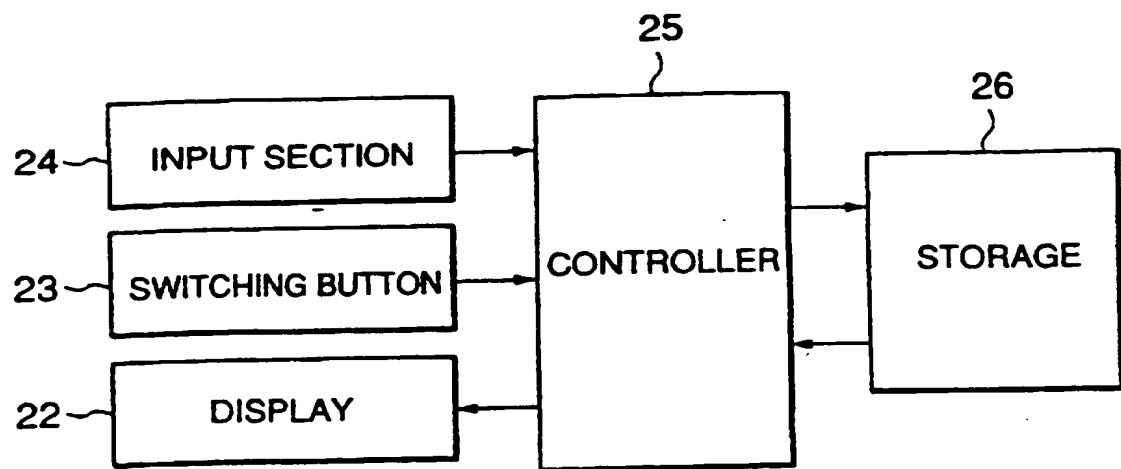


Fig.6

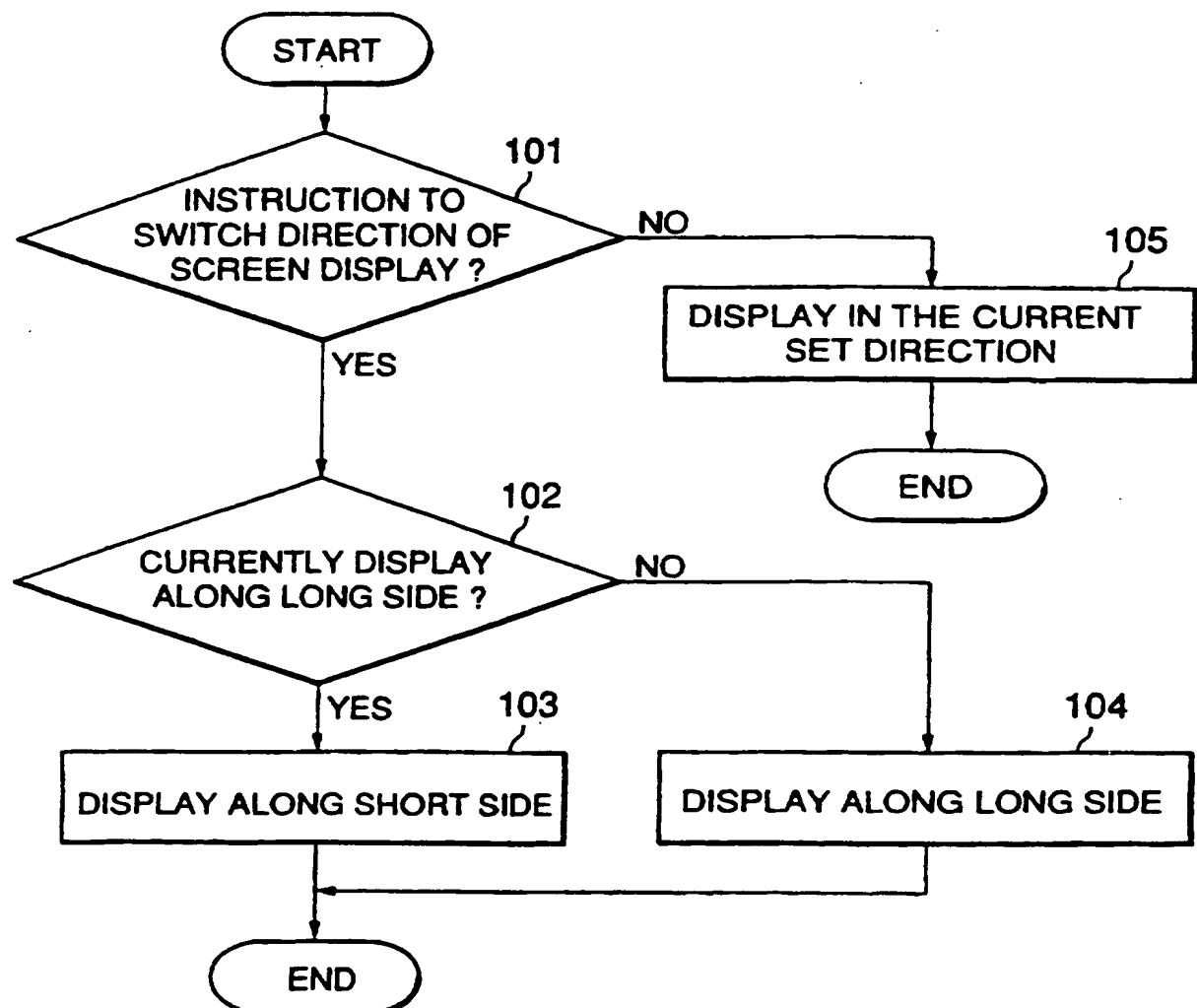
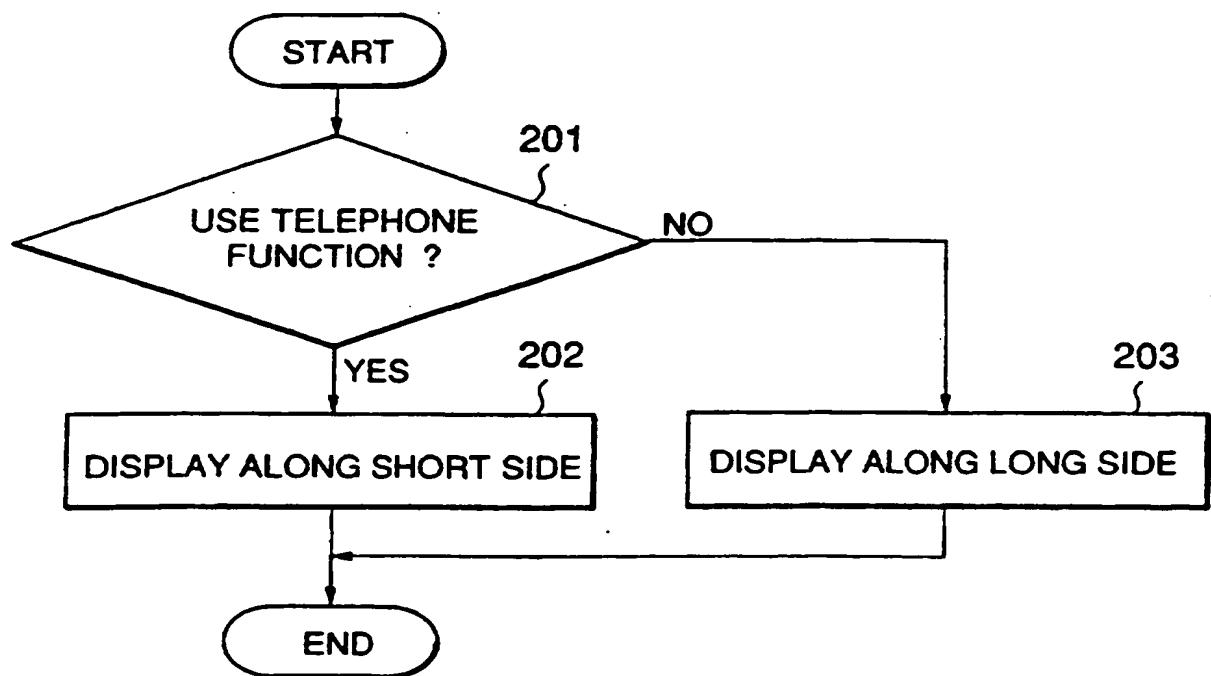


Fig.7



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Fig.8a

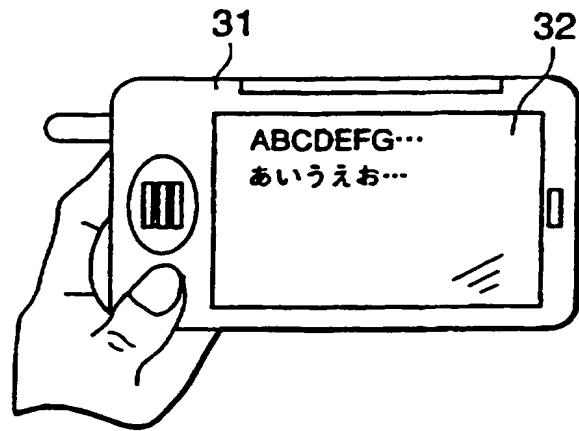
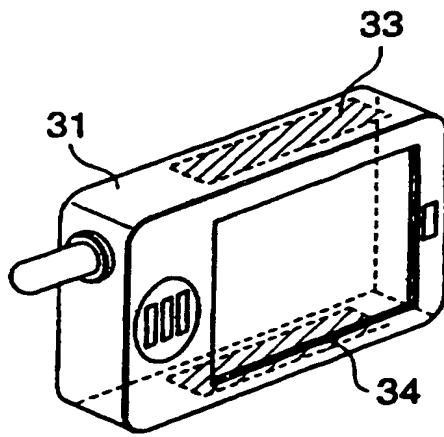


Fig.8b



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Fig.9a

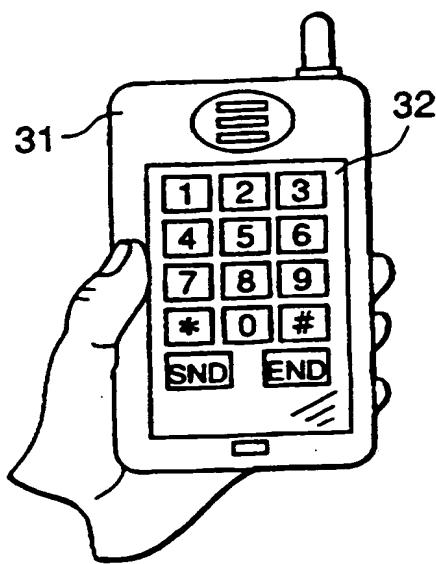
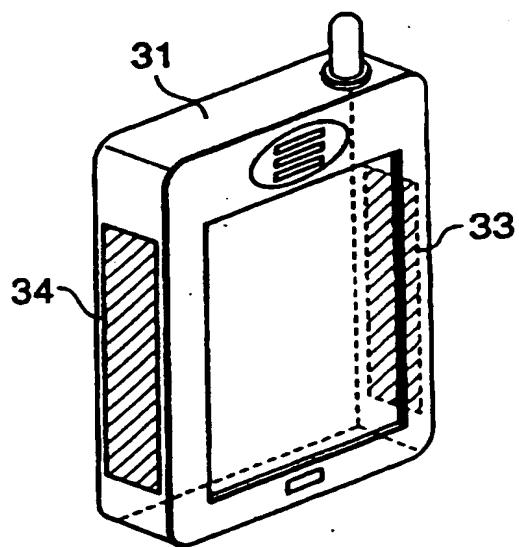


Fig.9b



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Fig.10

32

SCHEDULER	
DATE	JUNE 6(FRI.), 1997
TIME	14:20~16:20
CONTENTS	BUSINESS MEETING <PLACE:2ND MEETING ROOM IN HEAD OFFICE>

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Fig.11

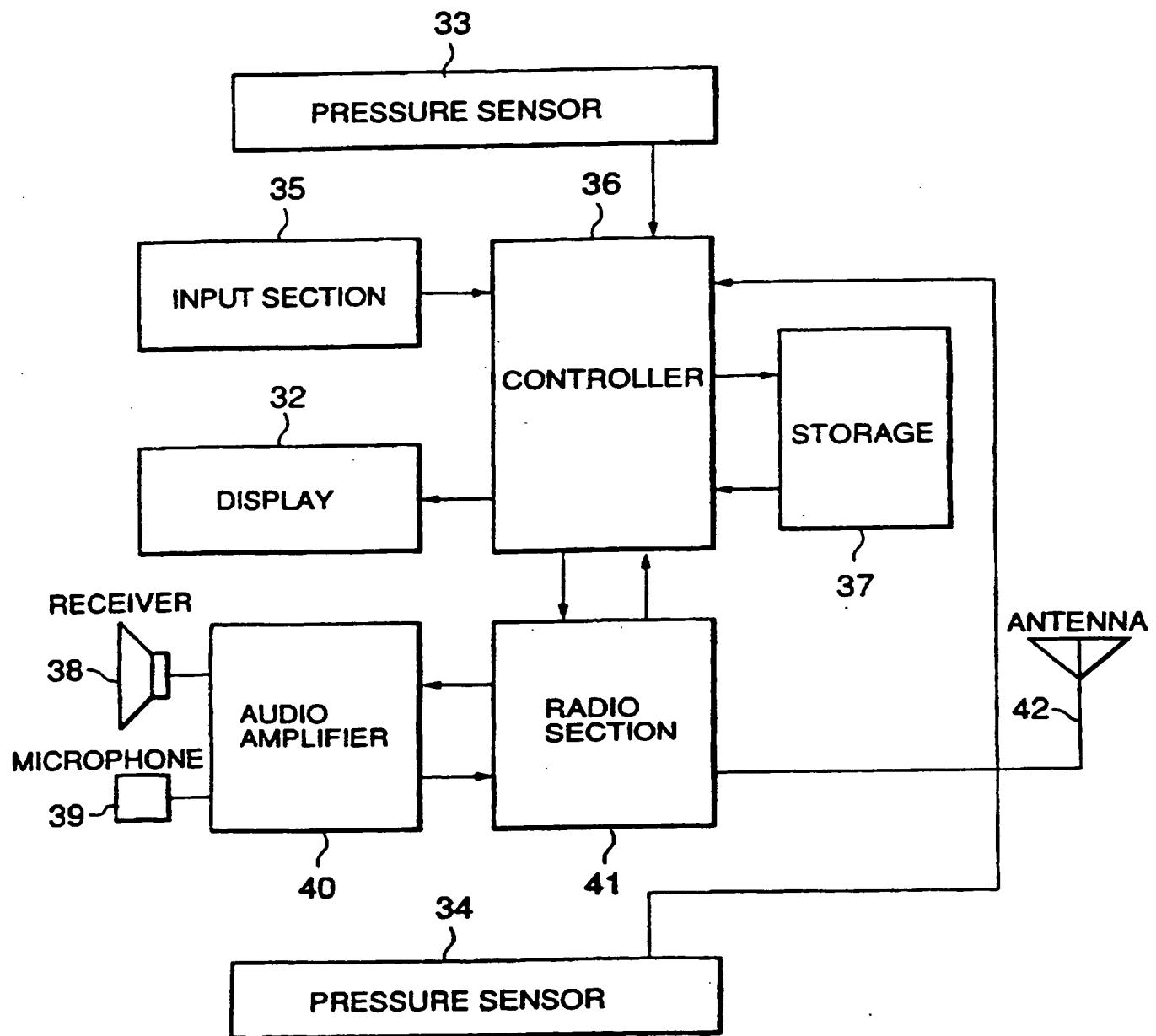


Fig.12

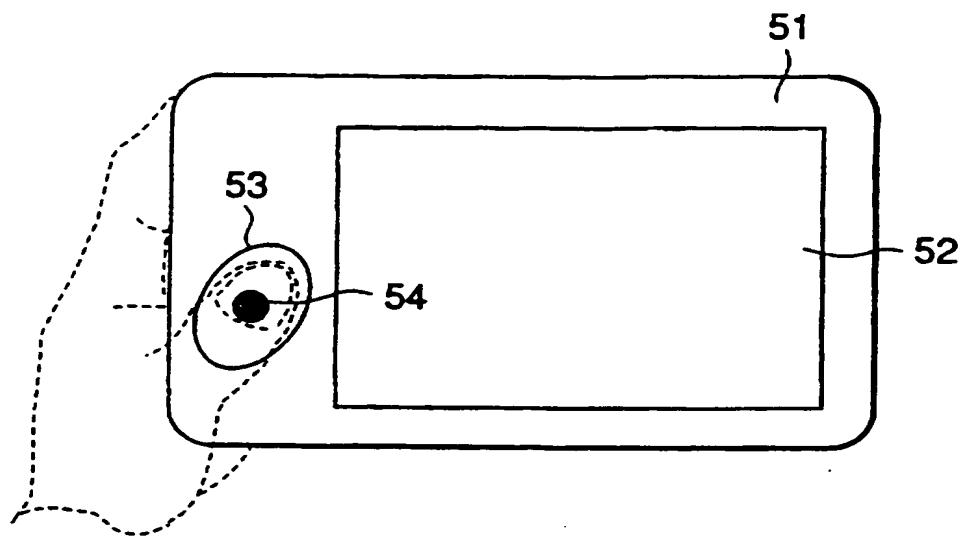
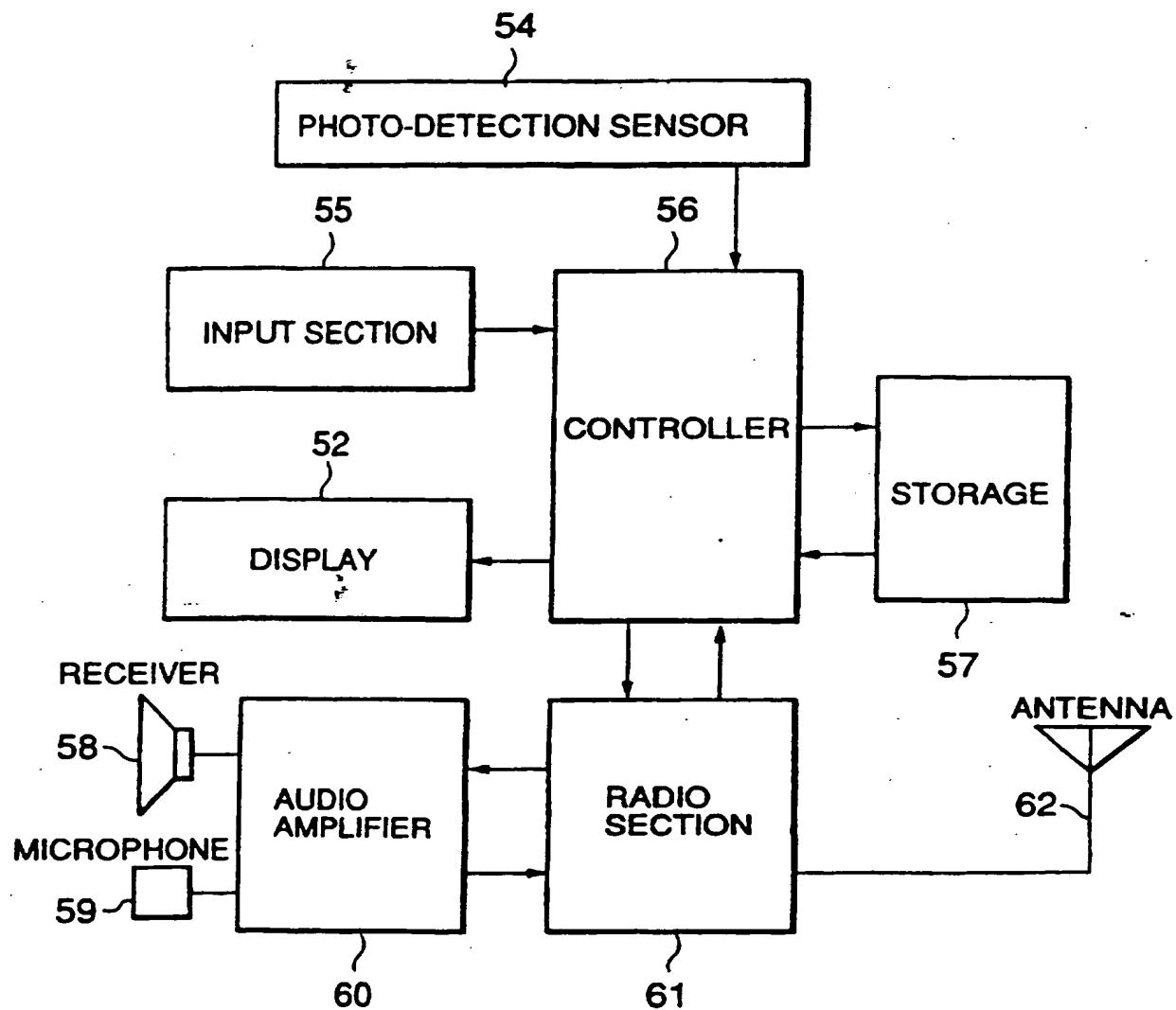


Fig.13



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Fig.14

